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An Energy Industry Case Study In Expropriation Risk

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Traditional damage theory looks at ex ante sunk costs[1] as an explanation for how vulnerable to expropriation an industry may be. The larger the sunk costs (i.e., highly specific assets such as gas and electricity networks), the higher the risk of ex post opportunistic behavior by the government.

That is, once a company has made an irreversible investment, the government will have every incentive to appropriate the profits generated by the asset by decreasing its revenue flow. This is normally why, before making the investment, investors will require ex ante guarantees that their investment will not be expropriated ex post through a reduction of the revenue flows to the asset.[2]

This is a significant issue, particularly as the energy transition continues to transform the market for public utilities and investors alike. For instance, just this January, Russia was found liable to pay over $200 million for the unlawful expropriation of the assets of a Ukrainian electricity company.[3]

Importantly, however, sunk costs alone cannot explain how a firm can prevent expropriation or minimize losses once expropriation is under way. The ratio of sunk to avoidable costs can. If a firm has a high sunk-to-avoidable-cost ratio, it will be highly vulnerable to expropriation, as the government will be able to reduce the revenue flow to the company by a large amount — expropriating the sunk assets — before the firm decides to stop operations.

Alternatively, a firm with a low sunk-to-avoidable-cost ratio can signal to the government that it will not tolerate any revenue reductions, for it will stop operations as soon as revenues are lowered. The ratio of sunk to avoidable costs can therefore (1) act as a deterrent for governments that may want to indirectly expropriate a company by reducing revenues; or (2) help a company mitigate damages by shutting down once expropriation is under way.

Importantly, this ratio varies considerably across energy-producing technologies. For instance, unconventional oil and gas has a low sunk-to-avoidable-cost ratio, while wind and solar renewables' ratios are high. This has significant implications when it comes to the guarantees investors should require from governments, and is exactly what we observe in high-risk developing countries like Argentina.

During the 2016-2017 auctions of renewable projects, investors in renewables demanded a series of guarantees from the government — guarantees not demanded by investors in auctions of thermal power projects during the same period, or by investors in unconventional oil and gas production in, for instance, the Vaca Muerta fields in Southern Argentina.[4]

The following breaks down expropriation risk and damage mitigation by different energy sources and uses Argentina as a case study for how energy investors might act to protect their interests.

Expropriation Risk and Damage Mitigation

Conventional and Unconventional Oil and Gas Production

Conventional oil and gas[5] develops in pools housed by rock formations that typically have high porosity and permeability. These formations are normally found below impermeable rock beds that, once tapped, allow the underground oil and gas to freely flow to the surface by their own natural pressure and with minimal mechanical or chemical stimulation.

As such, most of the investment necessary to extract the hydrocarbons (i.e., land, exploration permits, geological surveys, drilling rigs and equipment) is made at the beginning of the project's life cycle.

Once this investment is sunk, the borehole drilled and the reservoir tapped, oil and gas will flow to the surface by their own natural pressure, henceforth requiring only operation and maintenance expenditures to keep the process running. Upfront facilities plus drilling costs can then reach 70% to 80% of total costs, while the operating expenses and operation and maintenance are around 20% to 30%.[6]

As the long history of oil and gas nationalizations in developing countries demonstrates, any expropriatory government will find it very tempting to take over a project like this; that is, one with a large upfront sunk investment, no alternative use once committed, and operation and maintenance expenditures that can be avoided without preventing underground resources from freely flowing to the surface.[7]

Contrary to conventional oil and gas production, unconventional oil and gas cannot flow naturally to the surface because they are trapped within rocks and have to be extracted by fracturing them using high-pressure water, chemicals and sand.

This rock-fracturing, or fracking, however, is a continuous process. If fracking stops, hydrocarbons will remain trapped inside the rock formation. Thus, fracking resembles a manufacturing process that needs a constant flow of investment to keep the assembly line producing output.[8]

In unconventional oil and gas, the initial sunk investment in land acquisition, geological surveys and drilling equipment is around 30% to 40% of total costs,[9] while well completion and operation and maintenance expenditures comprise the remaining 60% to 70%.

In this case, an expropriatory government trying to take over the investment will think it twice. Only 30% of costs can be expropriated (i.e., land and sunk drilling equipment) and 70% of avoidable costs have to be incurred on an ongoing basis; otherwise no production takes place.

Conventional Thermal and Hydropower Generation

In conventional thermal power generation, 50%-60% of total costs are avoidable, representing fuel costs (i.e., natural gas, liquid fuels or coal) and operation and maintenance expenditures, including labor and materials. The remaining 40%-50% represent the initial sunk investment in the power plant itself plus the land plot it sits on.

In hydropower generation, however, fixed investment and sunk costs amount to 70%-80% of total costs and include the land, dam and dam wall, and the power-generating facilities. Avoidable costs represent 20%-30% and account for only operation and maintenance expenditures.

Wind and Solar Renewable Power Generation

As noted above, wind and solar renewable power generation have a very high sunk-to-avoidable-cost ratio, meaning that there is no cost that can be avoided to mitigate damages when the government starts reducing revenue. As long as the sun is shining and the wind is blowing, electricity will be generated and injected into the transmission grid anyway, no matter what the company or the government do.

Figure 1: Revenues Versus Sunk Plus Avoidable Costs for Different Technologies

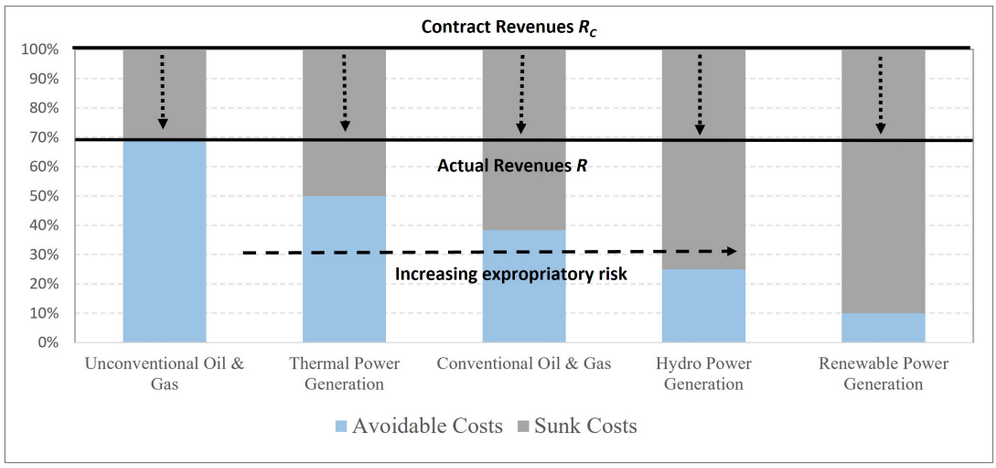

Figure 1 illustrates how expropriation risk increases as the sunk-to-avoidable-cost ratio increases for different technologies. The technology least vulnerable to expropriation is unconventional oil and gas production. As soon as the government starts reducing revenues seeking to expropriate sunk investment, it may quickly hit avoidable costs, causing the oil or gas rig to shut down and halt production with minimum benefit for the government.

On the other end of the spectrum we see renewables with very low, even zero, avoidable costs, providing the government ample room for revenue reduction and asset confiscation without fear of output reduction. This is precisely why investors require additional guarantees to be willing to sink investment in the renewables sector — especially in high-risk countries such as Argentina.

Guarantees to Reduce Expropriation Risk in Renewables

During 2015-2019, Argentina embarked on a very ambitious program to attract private investment into the power generation sector, seeking more than 4 gigawatts of new capacity in thermal plants and 6 GW in the renewable energy sector. This capacity was finally allocated through several rounds of bidding processes conducted by Argentina's system operator, Cammesa, in 2016 and 2017.

The thermal capacity was allocated through two rounds of bidding processes where potential investors had to make bids on firm capacity to be installed (megawatts), capacity remuneration ($/MW month) and (non-fuel) variable costs ($/MW hours), with Cammesa itself being the sole offtaker to the power purchase agreements and offering only standard contract guarantees.[10]

To participate in the bidding process for renewables projects, investors demanded additional

guarantees that were provided by the RenovAR program.[11] This program created a dedicated public trust fund, Foder, that would provide guarantees for investors to enhance the bankability of the power purchase agreements and to protect the projects against the risks of:

- Nonpayment and/or delayed payment by Cammesa for the generated and delivered electricity;
- Early termination of the contracts through a compensation implemented via a put option that would allow investors to sell the project's assets at their net, nondepreciated, original value to the Foder fund under certain circumstances; and finally
- In case of nonpayment of the put option, there would be optional guarantees payable by the World Bank up to $500,000 per MW for a maximum of $500 million.

As of December 2023, 152 renewable energy projects are already in operation and 38 are under construction, totaling $8.3 billion in direct investment and 6.6 GW of new-built capacity — amounting to 15% of the 43.5 MW of total installed capacity in Argentina's power sector.[12]

Conclusion

Rather than sunk costs alone, it is the ratio of sunk to avoidable ones that can (1) act as a deterrent for expropriation; or (2) help a company mitigate damages by shutting down once expropriation is under way. This ratio varies considerably across energy producing technologies.

Unconventional shale and tight oil and gas production have a low sunk-to-avoidable-cost ratio, showing a strong natural protection against indirect expropriation. Unconventional oil and gas producers will signal to the government that any attempt to lower their revenues will be met by the credible threat of freezing operations with an immediate halt in oil and gas production.

This is probably why we observe a booming unconventional oil and gas sector in Argentina, even with 2,000 basis points of country risk premium.

Wind and solar renewable power generation have very high sunk-to-avoidable-cost ratios, rendering them highly vulnerable to ex post opportunistic behavior by the government. This is why we observe investors demanding additional guarantees from the government in Argentina during the 2016-2017 auctions of renewable projects.

Consequently, and particularly in high-risk countries, additional guarantees against expropriation for investors should be granted only in those sectors with high sunk to avoidable cost ratios, including renewables, hydropower and conventional oil and gas.

Correction: A prior version of this article misstated Argentina's country risk premium. The error has been corrected.

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[1] Sunk costs are those costs that cannot be eliminated even by a complete halt in production. See William J. Baumol & Robert D. Willig, "Fixed Costs, Sunk Costs, Entry Barriers, and Sustainability of Monopoly," The Quarterly Journal of Economics 96:3 (August 1981), 405–431. https://doi.org/10.2307/1882680.

[2] See Chambouleyron, A. (2014) Mitigating Expropriation Risk through Vertical Separation of Public Utilities: The Case of Argentina, Utilities Policy, 30 (2014) 41-42, http://www.sciencedirect.com/science/article/pii/S0957178714000460.

[3] https://www.iisd.org/itn/en/2024/01/13/uncitral-tribunal-finds-russia-liable-to-pay-usd-207-8-million-for-the-unlawful-expropriation-of-the-assets-of-a-ukrainian-electricity-company/.

[4] Between January 2016 and December 2023, Argentina's country risk premium (CRP) as measured by Standard and Poor's EMBI, increased from 450 bp to 2.000 bp (a 310% increase) while non - conventional gas production increased from 6.3 million cubic meters per year to 28 million cubic meters in 2023, a 340% increase. During the same period though, conventional gas production fell from 36.6 million cubic meters per year to 20 million cubic meters per year, a 45% reduction. See https://www.argentina.gob.ar/economia/energia/planeamiento-energetico/panel-de-indicadores/superset-prod-gas-conv-y-no-conv.

[5] See Monaldi (2021) for the political economy of expropriation risk in the conventional and unconventional oil and gas sector in Argentina at https://www.sciencedirect.com/science/article/abs/pii/S0301420721002804.

[6] See EIA (2016) "Trends in U.S Oil and Natural Gas Upstream Costs" at https://www.eia.gov/analysis/studies/drilling/pdf/upstream.pdf p. 7.

[7] See Monaldi (2021) https://www.sciencedirect.com/science/article/abs/pii/S0301420721002804.

[8] See Newell, Prest and Vissing (2016) "Trophy Hunting vs. Manufacturing Energy: The Price-Responsiveness of Shale Gas" a Resources for the Future publication, https://www.rff.org/publications/working-papers/trophy-hunting-vs-manufacturing-energy-the-price-responsiveness-of-shale-gas/.

[9] For more details see EIA (2016) "Trends in U.S Oil and Natural Gas Upstream Costs" at https://www.eia.gov/analysis/studies/drilling/pdf/upstream.pdf.

[10] See SEE Resolutions 21/2016 and https://servicios.infoleg.gob.ar/infolegInternet/anexos/255000-259999/259703/norma.htm and Res 287/2017 https://servicios.infoleg.gob.ar/infolegInternet/anexos/270000-274999/274571/norma.htm.

[11] See RELP (2023) https://www.energygreenmap.org/renovar/renovar-case-study-2023.pdf pp. 11-16.

[12] See RELP (2023) https://www.energygreenmap.org/renovar/renovar-case-study-2023.pdf.